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1. Your reference

6.70.1047 UK

02DEC02 E767560-16 D00073
P01/7700 0.00-0227941.2

2. Patent application number
(The Patent Office will fill in this part)

0227941.2

29 NOV 2002

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

INTERBREW S.A.
VARSTRAAT 94
B-3000 LEUVEN
BELGIUM

Patents ADP number *(if you know it)*

7906530002

If the applicant is a corporate body, give the country/state of its incorporation

A BELGIAN CORPORATION

4. Title of the invention

BEER LINE AND FLOW RESTRICTOR

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

G.F. REDFERN & CO.
LYNN HOUSE
IVY ARCH ROAD
WORTHING
WEST SUSSEX. BN14 8BX

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Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

YES

6.70.1047

BEER LINE AND FLOW RESTRICTOR

Field of the Invention

The present invention relates to an alcohol beverage dispensing apparatus and in particular, relates to a beer line for dispensing beer, usually in association with tap adapter for mounting with a container or keg.

Background of the Invention

It is known to contain alcohol, such as wine in bags contained in a cardboard type container where the wine feeds by gravity through a shut off tap mounted outside the container. Further, it is known to fill a bag with beer in a keg. In the case of a beer keg, pressure is applied to the bag to dispense the beer from the bag and out of the keg. Further, the bag is inserted into the keg container prior to the beer being filled into the bag through a valve assembly.

However, there is a need for the user to be able to control the dispensing of the beer from the keg out through a tap connected to the valve assembly particularly in special circumstances where the beer is to be dispensed directly from the keg. These special circumstances occur

when the keg is utilized at an outdoor activity or where a consumer does not desire to purchase a home beer dispensing system and still desires to make use of beer stored in a keg.

Summary of the Invention

It is an object of the present invention to provide a conduit for fluidized liquids, that helps to reduce foam generation during flow through the conduit. The present invention finds application in relation to conduits for conducting carbonated liquids; or, a nitrogenated liquids; or a combination carbonated and nitrogenated liquids. Although a variety of uses for such conduit can be envisaged, the application as a liquid dispense conduit is particularly relevant with regard to avoiding excessive foam formation – and examples of this arise in beverage dispensing, especially in the case of beer.

Generally speaking, the present invention relates to a conduit for conducting gasified liquid, which has a flow restrictor arranged in in-line relation therewith.

The restrictor itself comprises an at least one aperture (although two or more can be used in series), each such being adapted to pass the gasified liquid flowing through the conduit and across a pressure drop from a higher-pressure upstream side of the aperture to a lower-pressure downstream side of the aperture.

The aperture is operable to moderate the rate of change in pressure over a transitional pressure drop to mitigate the formation of localized pressures below a critical pressure at which off-gassing from the carbonated liquid results in substantial foam formation.

In some applications it is actually preferable to employ a plurality of apertures arranged in series along the path of the gasified liquid flow.

In this case, sequential downstream pressure drops are produced between successive pairs of apertures to respective intermediate pressures that are lower than the pressure upstream of the first aperture in the series and higher than the pressure downstream of the last aperture in the series. This arrangement improves the overall effect of mitigating against foam formation. At least two such apertures, and preferably static apertures are preferred.

In a particularly preferred embodiment, the conduit contains at least one apertures which is venturi-shaped. It is desirable, particularly in the case of beer dispensing operations, that such a venturi has a back angle of less than 24 degrees, preferably about 20 degrees or less, and even more preferably, about 15 degrees or less.

The conduit is preferably formed as a formed tube having an integral stricture arranged along the length thereof, to provide for the requisite aperture – and in preferred embodiments, to form the venturi shaped aperture in particular.

Although the tubing can be preformed (cast or extruded for example) to provide for the requisite aperture, it is also possible to form the tube up "in situ". For example, where the conduit is a pliable tube, which is compressible in situ to form an aperture by the application of external force – the application of external force as a clamping action along a tube-contacting face of a cam or wedge shaped body, can be used to produce a correspondingly shaped aperture within said tube and hold the tube in position relative the rest of a dispensing apparatus.

Preferably the inlet end and the outlet end of the conduit are substantially the same internal diameter – although variations on this are possible if desired. In any case, in a beer dispense application, it is

desirable that the inlet end be adapted to engage a beer keg valve; and, that the outlet end be a nozzle through which the beer is dispensed into a beverage container. Such a conduit is inexpensive, and easily installed. Moreover, it is particularly well suited to use if comprised of a flexible tubing that can be compressed by an external clamping valve to constrict flow between substantially free flowing dispense and shut-off conditions.

Brief Description of The Drawings

For a better understanding of the nature and objects of the present invention reference may be had to the accompanying diagrammatic drawings in which:

Figure 1 is broken away perspective view of the keg showing the valve and spear assembly mounted within the keg;

Figure 2 is a sectional side view of the valve and spear assembly as shown in Figure 1;

Figure 3 is a plan view of the valve body of the valve assembly;

Figure 4 is a sectional side view of the tap adapter mounted to the keg;

Figure 5 is a side sectional view of the tap adapter of Figure 4 showing the tap pivoted open; and,

Figures 6 and 7 are perspective views of the tap adapter respectively showing the hollow arm in closed and open positions.

Figure 8 is a schematic cross-section of a venturi arrangement according to the present invention, and depicting operating conditions and dimensions particularly suited to beer dispensing applications.

Figure 9 is an exploded view of a tap adapter showing the insertable tubular cartridge comprising a venturi equipped conduit of the

present invention.

Detailed Description Of The Invention

In a preferred application of the present invention, the a venturi equipped conduit is employed as an insertable cartridge in a beer tap aperture – which is useful in turn, in dispensing beer from a keg in either free-standing applications, or from within a housing as for example in the case of a beer cooling appliance or the like.

Referring to Figures 1 through 3, the preferred valve assembly 40 and spear 102 are shown.

The valve assembly 40 is adapted to fit into a raised collar aperture 42 of keg 22. The valve assembly 40 has an annular shaped body 46 that is secured in the aperture 42. The valve body 46 has an annular groove 47 and flange 49 that is adapted to extend above the keg 22 for mating with a tap dispensing adapter 38 (Figure 4) connected to tap 14.

The valve body 46 has a first passageway 48, a second passageway 50, and a third passageway 52 spaced apart from each other and extending through the valve body 46. As best seen in Figure 6, the first passageway 48 is centrally disposed or located within the valve body 46 and the second and third passageways 50, and 52 are spaced radially of the first central passageway 48.

The valve assembly includes a first valve 54, a second valve 56 and a third valve 58. The first valve 54 is seated in the first passageway 48 for controlling the flow of the beverage or beer through the first passageway 48 into and out of the bag 44.

The second valve 56 is seated in the second passageway 50 for controlling the flow of gas such as carbon dioxide through the second passageway 50 into and out of the bag.

The third valve 58 is seated in the third passageway 52 and controls the flow of gas through the third passageway 52 into and out of the keg 22 exterior to the bag 44.

Each valve, 54, 56, and 58 has a valve actuator or stem 60 that effectively opens and closes the valve. The valve stem 60 extends away from the valve body 46 by a different predetermined distance for each of valves 54, 56 and 58. Each of the valves 54, 56 and 58 further include a valve head 70 connected to the valve stem 68. The valve head 70 carries an O-ring 72 which is adapted to seal the valve head within the respective passageway. A spring 74 urges the valve head 70 into sealing engagement with its corresponding passageway. The valve stems 68 are accessible from outside the keg 22 for moving each valve head 70 into an open and closed position to respectively enable and inhibit fluid flow through passageways 48, 50 and 52.

The valve body 46 has an annular recessed groove 62 recessed in an inner wall 64 of the valve body 46. The inner wall 64 is positioned within the keg 22. The recessed grooves 62 is adapted for receiving the neck 66 of bag 44 in press fit relation therewith. The annular recessed groove 62 has a diameter that surrounds the first and second passageways 48 and 50. The third passageway 52 is located outside of the diameter of the recessed groove 62 and as a result, the third passageway 52 is located outside of the bag 44.

The keg 22 has a collar flange 82 which defines the raised collar aperture 42, the valve body 46 has an outer peripheral wall 63 with a recessed groove 61 extending around the outer wall 63. An intermediate ring or bung 80 is adapted to seat the valve body 46 within the raised collar aperture 42. The intermediate ring 80 has inner and outer walls 84,

86. The inner wall 84 has flange 88 extending inwardly thereof that is adapted to fit into the recessed groove 61 of the outer wall 63 of the valve body 46. The outer wall 86 of the intermediate ring 80 has a resilient barb 90 and a locking flange 92 spaced from the barb 90 so as to define a outer locating groove 94 into which the collar flange 82 of the keg 22 is held. The barb 90 is adapted to pass through the aperture 42 and spring back into locking engagement with the collar flange 82 so as to lock the valve assembly 40 in place. Special tools are required to remove the valve assembly 40 and the intermediate ring 80 from the collar flange 82 of the keg 22 once the keg 22 is returned to the brewery for refilling.

In order to ensure that the contents of the keg 22 have not been tampered with, the keg 22 has an anti-tamper ring 96 that overlays the intermediate ring 80, a portion of the keg 22 and a portion of the valve body 46. The intermediate ring 80 has an aperture 98 that passes completely through the intermediate ring 80 to provide a vent passageway. The anti-tamper ring 96 has a flange part 100 that is inserted into the vent aperture 98 of the intermediate ring 80. In the event the anti-tamper ring 96 is removed from the keg 22, vent aperture 98 is open and the contents or any pressure within the keg 22 is released. Further, as a pressure relief feature, the anti-tamper ring 96 is designed to release from aperture 98 when pressure in keg 22 exceeds a predetermined valve to vent pressurized air through aperture 98.

Referring to Figures 4 to 7, the tap adapter 38 of the present invention is shown in more detail. The tap adapter 38 is mounted to the valve assembly 40 in fluid flow communication with the first valve 54. This attachment is a snap action sealed attachment on inner and outer walls of valve flange 49.

The dispenser adapter 38 has a hollow arm 120 that has a first end portion 122 adjacent the valve assembly 40 and a second end portion 24 which is remote therefrom. The first end portion 122 is connected to the first valve 54 so as to open the valve 54. This connection is made when the adapter is snap fitted downwardly onto the valve neck flange 49. The hollow arm 120 extends from the valve assembly 40 out through the housing 17 to a position where the remote end portion 124 of the hollow arm 120 is outside of the housing 17.

As better shown in Figures 5 and 7, the hollow arm 120 is separable by a hinge point 130. The arm 120 is separable into an upper arm portion 132 and a lower arm portion 134. As shown in Figure 7, lower arm portion 132 carries the tap 14 integral therewith. The lower arm portion 134 comprises a half hollowed out passageway 137 (see Figure 7). Inserted into this lower arm portion 134 is a tubular cartridge 126 that has a tube 128 that interconnects the tap 14 with the first valve 54 so that the beverage may flow through the tube 128 and out the tap end 136.

The cartridge 126 is in effect a frame like member which is adapted to be snap fitted into place with the lower arm portion 134. The cartridge 126 also carries the tube 128 therethrough for connection into the first end portion 122 of the hollow arm 120 so that when the cartridge is inserted into the hollow arm 120, and the hollow arm is subsequently mounted onto the valve assembly 40, one end 129 of the tube 128 sealingly engages passageway 48 and opens valve 54 so that beverage may be dispensed through valve 54 and into the tube 128. The upper arm portion 132 as shown in Figure 7 may then be snapped back into place relative to the lower arm portion 132.

The adapter 38 is provided with a base portion 140 for supporting the hollow arm 120. The base portion 140 has a neck or supporting ring 142 that is adapted to surround and releasably engage the valve neck flange 49. The base portion 140 further includes an annular flange portion 144 which provides an inverse shape of a saucer that is adapted to abut the top surface of the keg 22 and to be supported thereon.

The base portion 140 has locking spring members 146 (see Figure 7) that engage the valve neck groove 47 and are movable to release the adapter 38 from the valve assembly 40.

Tap 14 is connected to the remote end 124 of the hollow arm 120 and in particular the lower arm portion 134. The tap is operable between a closed position to shut off the flow of beverage through the hollow arm as shown in Figure 6 and an open position permitting beverage to flow through the hollow arm and out the tap 14 as shown in Figure 7. The tap 14 also forms an integral part of the hollow arm 120 and in particular the lower portion 134. The tap 14 has a handle 140 that is pivotally connected to a cam member 150 so as to rotate cam member 150 into pinching engagement against tube 128 as indicated at pinching point 152. The handle will be normally biased in this position and may be drawn forward to release cam member 150 from the tube 128 and thereby open the tube at point 152 and permit beverage to be dispensed along the tube 128 contained within the hollow arm 120 from the valve assembly 40.

As shown if Figures 4 to 7, the dispensing adapter 38 includes an air line passageway 160 adapted to be connected to a second air valve 58 in fluid flow communication. The air line passageway 160 has a first end or cap member 162 that connects to and opens the second valve 58 when the adapter 38 is snap fitted onto the valve system 40. The air line

passageway 160 has a second end portion 164 having a one way air valve 166 that is normally shut and that is opened when connected to a manually operable bellows air pump 10. Manual squeezing of pump 10 supplies air under pressure to the inside of keg 22 against bag 44. The air line passageway 160 is an integral part of the adapter 38.

The adapter 38 of the present invention has many advantages. In particular, the adapter 38 can be sold as a separate part to a consumer and the cartridge 126 may be sold as a replacement cartridge with each keg 22 refill for insertion into adapter 38 so as to provide a sanitary dispensing medium for the beverage. The cartridge 126 is inserted into the adapter 38 and the adapter 38 is moved into its closed position and snapped onto the keg neck 47. Because the adapter carries the tap 14 which is in a closed position, the snapping of adapter 38 onto the valve assembly 40 of the keg 22 in sealing relation therewith opens valve 54 and provides for a simple and reliable connection that does not result in any loss of beverage. At this time, the air supply line 160 is connected to the air valve 58 of the valve assembly 40. The keg 22 is ready for use as a portable free standing unit.

The adapter 38 is now ready to dispense beverage by drawing handle 148 forward releasing the cam 150 from pinching the tube 128 allowing the beverage to flow therethrough out through valve 54. It should be understood that pressure is applied against the bag 44 (Figures 1 and 2) in through the air line passageway 160 and through the valve 58 of the valve assembly 40 by manual operation of pump 10.

Referring now to Figure 8 of the drawings, there is illustrated a schematic longitudinal cross-section through a section of conduit 200 according to the present invention, in which the venturi 201 structure is

illustrated. As dimensioned, and for the operating conditions set out, the arrangement is particularly suited to home beer dispense applications.

Figures 9 and 10 illustrate the conduit 200 and the venturi 201, in relation to a beer dispense tap apparatus. Although not shown, Figure 10 makes it clear how a cam shaped clamp could be employed relative to a flexible conduit when clamped into the tap apparatus, to form the an aperture shape, in situ.

Referring to the drawings in general, and referring to an especially preferred embodiment of the present invention, the beer line possesses a venturi or a portion of tube that: tapers down gradually from around 8mm to 1.5mm; continues at 1.5mm diameter for 50mm or 60mm; and then expands outwards gradually back (through a back angle) to around 8mm. The length and diameter of the restricted portion combine to determine both the delivered flow rate of beer and the pressure drop across the restrictor. In the preferred case, this should be around 1 bar – the internal pressure of the keg- to avoid beer foaming. The diameter of the restrictor is also an influential factor – too large a diameter and the dispense flow rate is too high and there is little pressure drop, too narrow a diameter and the dispense flow rate is very slow. In forming the venturi, the tapered convergent and divergent sections are adapted to ensure that vortices are not created in the beer flow, which would lead to out localized low pressure regions and related out-gassing and foaming.

In a preferred form of venturi system to reduce pressure and control flow, an 8mm standard dia tube is used, having a 1.5mm dia through the integrally formed venturi, which extends for a length of over 50mm, and expands at a 20° inclusive angle (or by 10 degrees on both side) back to a final conduit diameter of 8mm. This gradual return to the

original tubing diameter reduces risk of foaming for the beer transiting this conduit (at about 2 ltr / min). Note that the same angles can be used on the upstream side of the venturi in reducing from the nominal tube diameter to the narrow venturi tube diameter. Under the conditions described herein and in the drawings, all sections of the conduit up stream of venturi including up to the keg valve, are above foaming pressure. Minimising distance after venturi to the dispense spout is also helpful.

Beer dispensing in this case involves a continuous dispense rate of between 1.5 litres/minute and 2.0 litres/minute without "excessive" foaming for the conditions described below. Air pressure maintained between 1.2 bar gauge and 1.5 bar gauge; Beer temperature (bottom 25%) < 9°C.

The cartridge is preferably a disposable item, and can be supplied new with each keg that a consumer purchases. Ease of use, and sanitation are advantages of this arrangement.

WHAT IS CLAIMED IS:

1. A conduit for conducting gasified liquid, said conduit having a flow restrictor arranged in in-line relation therewith, and said restrictor comprising an at least one aperture adapted to pass said gasified liquid flowing through said conduit and across a pressure drop from a higher-pressure upstream side of said aperture to a lower-pressure downstream side of said aperture, and wherein said aperture is operable to moderate the rate of change in pressure over a transitional pressure drop to mitigate the formation of localized pressures below a critical pressure at which off-gassing from the carbonated liquid results in substantial foam formation.

2. The conduit according to claim 1, comprising a plurality of apertures arranged in series along the path of the gasified liquid flow, and wherein sequential downstream pressure drops are produced between successive pairs of apertures to respective intermediate pressures that are lower than the pressure upstream of the first aperture in said series and higher than the pressure downstream of the last aperture in said series.

3. The conduit according to claim 2, wherein at least one of said apertures is venturi-shaped.

4. The conduit according to claim 2, wherein said apertures comprise at least two static apertures.

5. The conduit according to claim 1, wherein the aperture is shaped as a venturi.

6. The conduit according to claim 1, wherein the gasified liquid is selected from one of the group consisting of: a carbonated liquid; or, a nitrogenated liquid; or a combination carbonated and nitrogenated liquid.

7. The conduit according to claim 1, comprising a liquid dispense conduit.

8. The conduit according to claims 3 or 5, wherein said liquid is a beverage.

9. The conduit according to claim 8, wherein said beverage is beer.

10. The conduit according to claims 3 or 5, wherein said venturi has a back angle of less than 24 degrees.

11. The conduit according to claim 10, wherein said back angle is about 20 degrees or less.

12. The conduit according to claim 11, wherein said back angle is about 15 degrees or less.

13. The conduit comprises a formed tube having an integral stricture arranged there along to form the venturi

14. The conduit is a pliable tube, which is compressible in situ to form an aperture by the application of external force.

15. The conduit according to claim 13, wherein said application of external force is a clamping action.

16. The conduit according to claim 14, wherein said clamping action applies external force along a tube contacting face of a cam or wedge shaped body, to produce a correspondingly shaped aperture within said tube.

17. The conduit according to claim 1, in which the inlet end and the outlet end thereof are substantially the same internal diameter

18. The conduit according to claim 17 wherein the inlet end is adapted to engage a keg valve.

19. The conduit according to claim 17 wherein the outlet end is a nozzle through which the beer is dispensed into a beverage container.

20. The conduit according to claim 1, comprising a flexible tubing that is compressed by a valve to constrict flow between substantially free flowing dispense and shut-off conditions.

21. A pre-formed tubular cartridge for use as an insert in a tap adapter for use in dispensing an alcohol beverage from a keg having a self-

contained bag filled with an alcohol beverage, the keg having a neck and a valve assembly mounted to the neck of the keg where the valve assembly has a first valve through which beverage is dispensed from the keg and one of the keg and valve assembly has a second valve through which pressurized air is feed into the keg against an outside wall of the bag; the tap adapter comprising: a hollow arm adapted for releasably mounting in sealed relation with the valve assembly in fluid flow communication with the first valve, the hollow arm having a first end portion and a second end portion remote therefrom, the first end portion adapted to connect to the first valve to open the valve, and wherein the hollow arm supports said insertable tubular cartridge comprising a tube through which the beverage flows; a tap connected to the remote end of the hollow arm, the tap being operable between a closed position shutting off flow of beverage through the tube supported within said hollow arm and an open position permitting beverage to flow through tube within the hollow arm and out the tap; an air line passageway adapted to be connected to the second valve in sealed fluid flow communication therewith; and, a pump connected to the air line passageway for supplying pressurized air to the second valve.

22. The tap adapter of claim 21 wherein the air line passageway has a first end portion that connects to and opens the second valve, and has a second end portion connected to the pump.

23. The tap adapter of claim 21 wherein the air line passageway has an air valve adapted for connection to the pump.

24. The tap adapter of claim 21 wherein the valve assembly has a valve neck portion that extends beyond the neck portion of the keg, and the

adapter has a base portion for supporting the hollow arm, the base portion comprising a neck adapted to releasably engage the valve neck and an annular flange portion adapted to abut the keg.

25. The dispensing arm of claim 24 wherein the base portion has spring locking members that engage the valve neck and are movable to release the adapter from the valve assembly.

26. The tap adapter of claim 21 wherein the tap has a cam member that rotates to close fluid flow through the hollow arm of the adapter.

27. The tap adapter of claim 21 wherein the hollow arm is separable to receive a tubular cartridge for interconnecting the tap with the first valve and through which the beverage is dispensed.

28. The tap adapter of claim 27 wherein the hollow arm is pivotally connected adjacent the first end portion to permit for separation of the hollow arm into an upper arm portion and a lower arm portion.

29. The tap adapter of claim 28 wherein the lower arm portion is adapted to receive the cartridge in snap fit relation therewith.

30. The tap adapter of claim 29 wherein the tap has a cam member that rotates to close fluid flow through the tubular arm by pinching the tube closed.

31. The tap adapter of claim 21 wherein the pump is manually operated.

BEER LINE AND FLOW RESTRICTOR

ABSTRACT

The present invention relates to a conduit for conducting gasified liquid, which has a flow restrictor arranged in in-line relation therewith. The restrictor itself comprises an at least one aperture (although two or more can be used in series), with each such being adapted to pass the gasified liquid flowing through the conduit and across a pressure drop from a higher-pressure upstream side of the aperture to a lower-pressure downstream side of the aperture. The aperture is operable to moderate the rate of change in pressure over a transitional pressure drop to mitigate the formation of localized pressures below a critical pressure at which off-gassing from the carbonated liquid results in substantial foam formation.

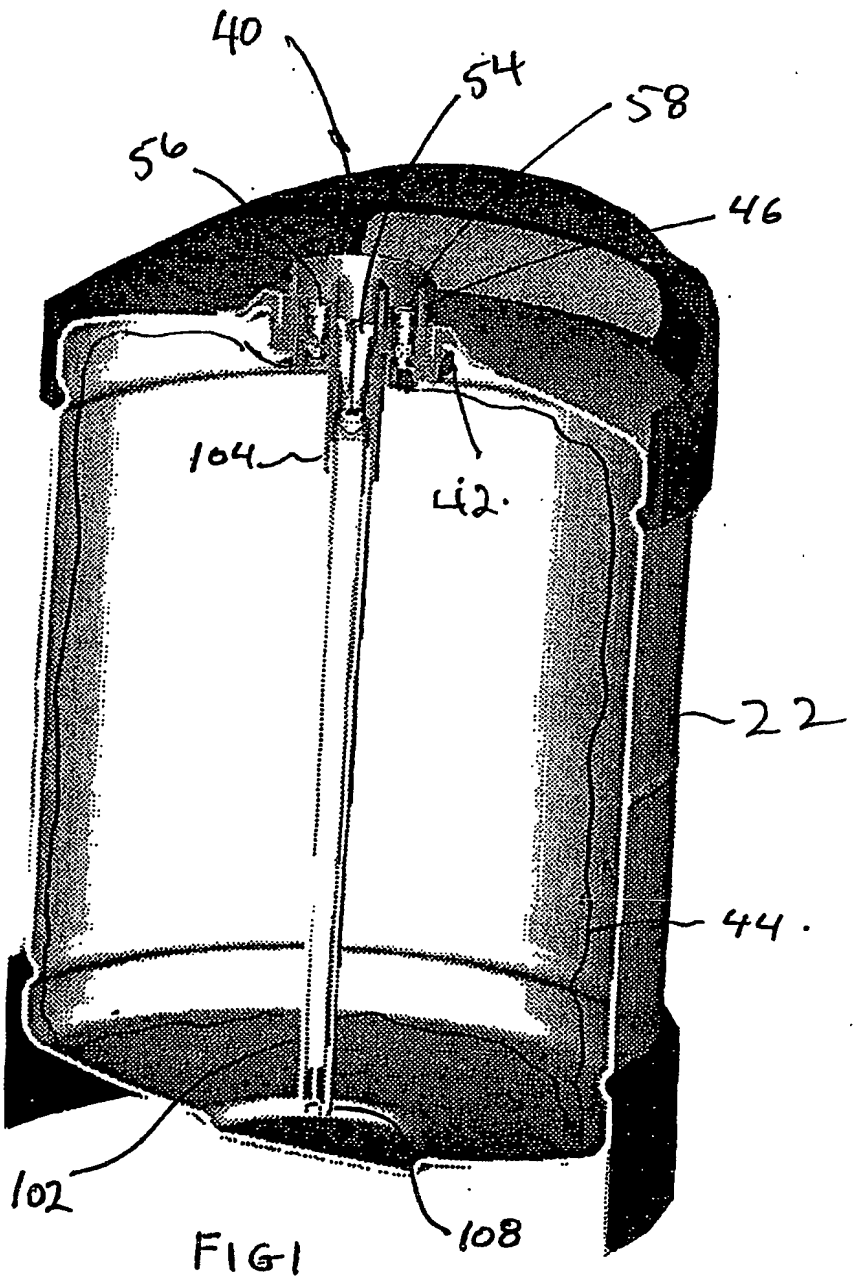

FIG1

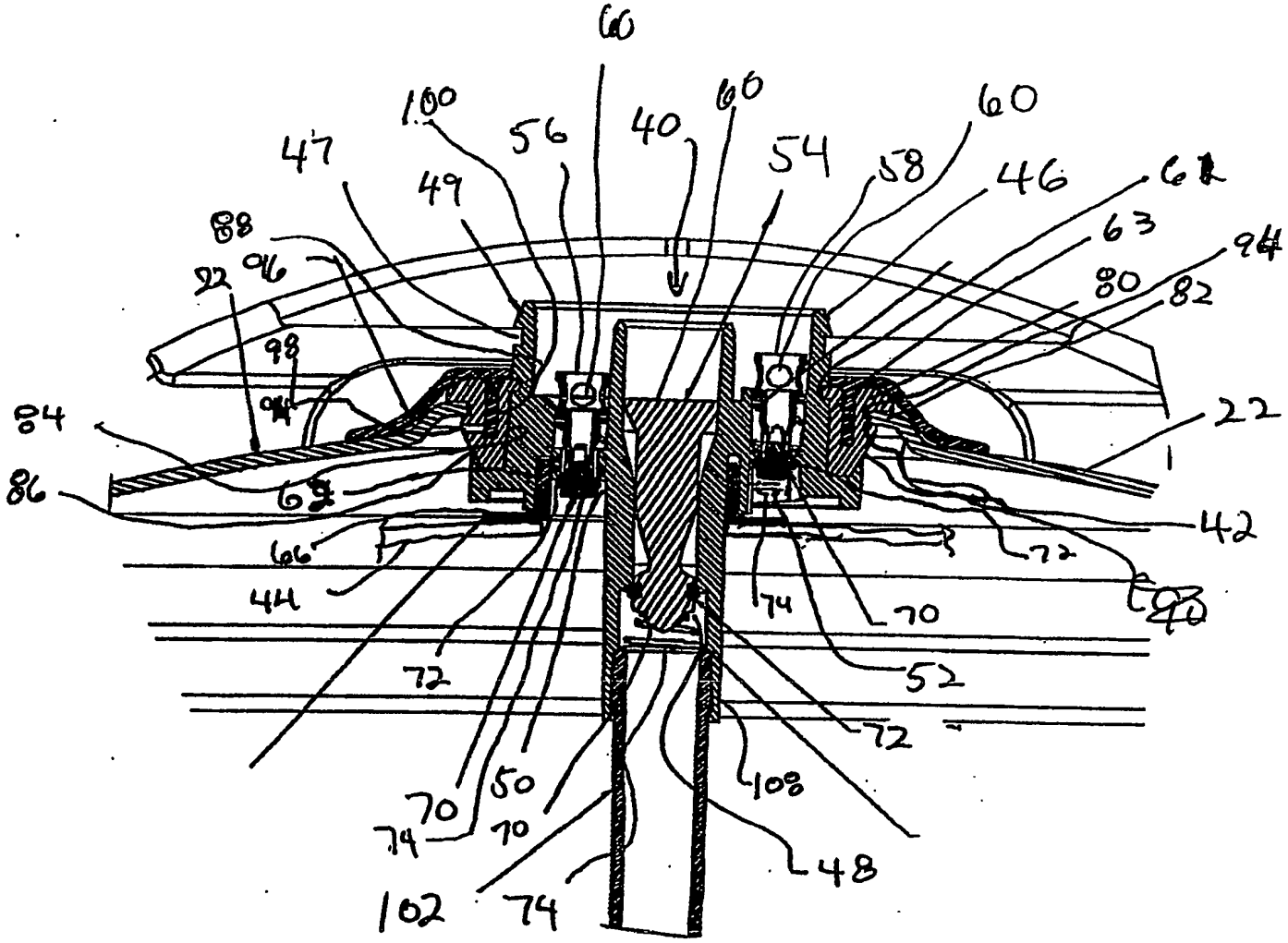

FIG. 2

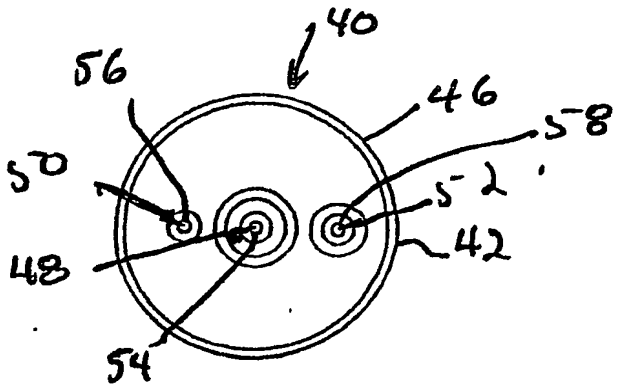

FIG. 3

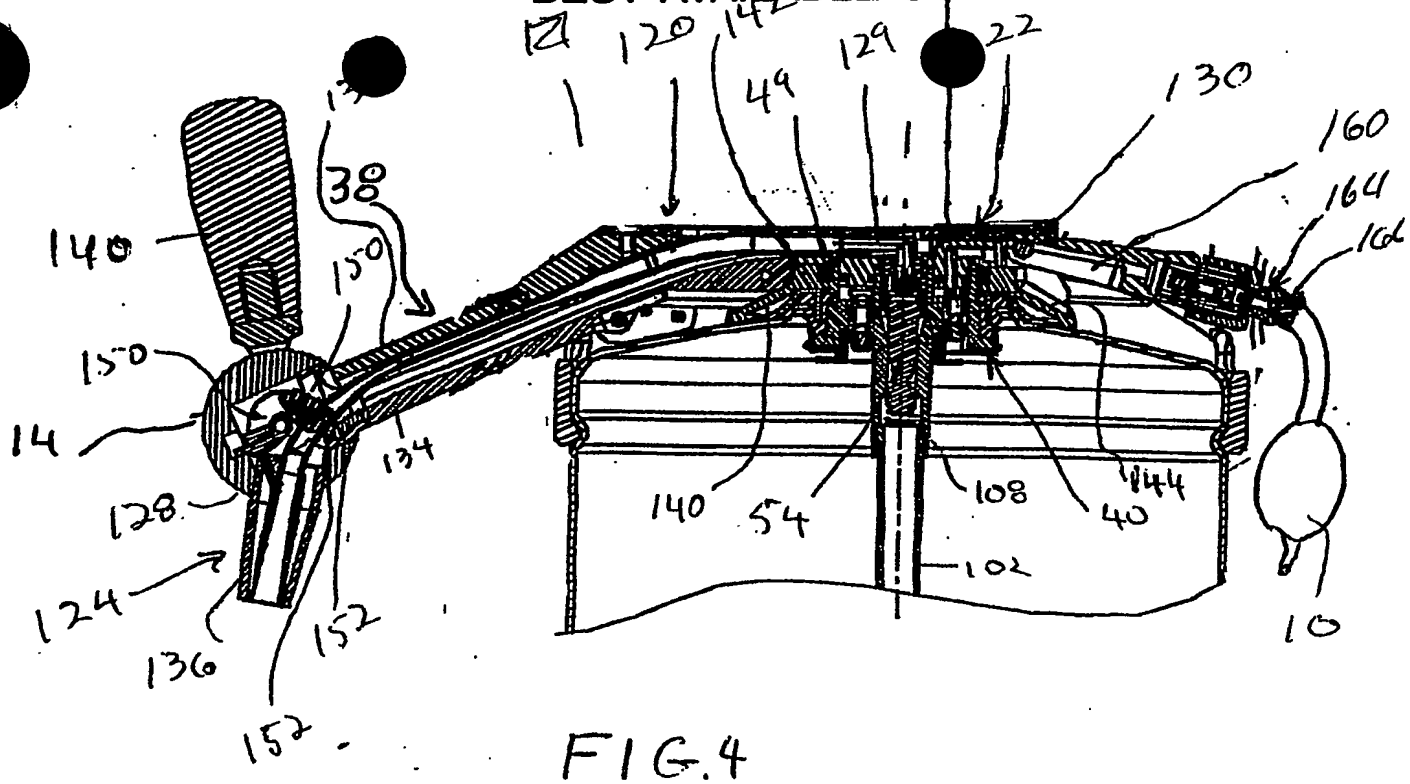

FIG. 4

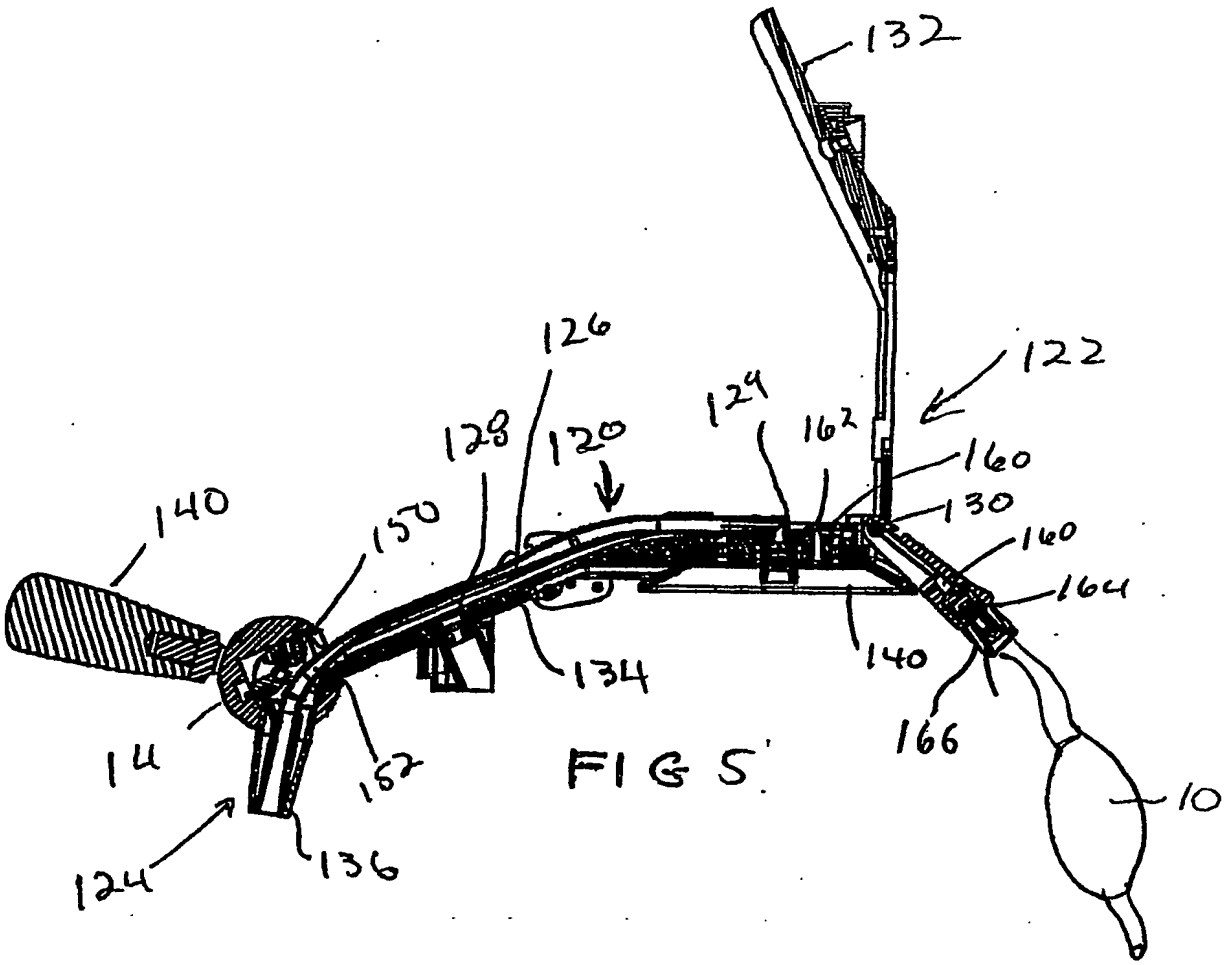

FIG 5

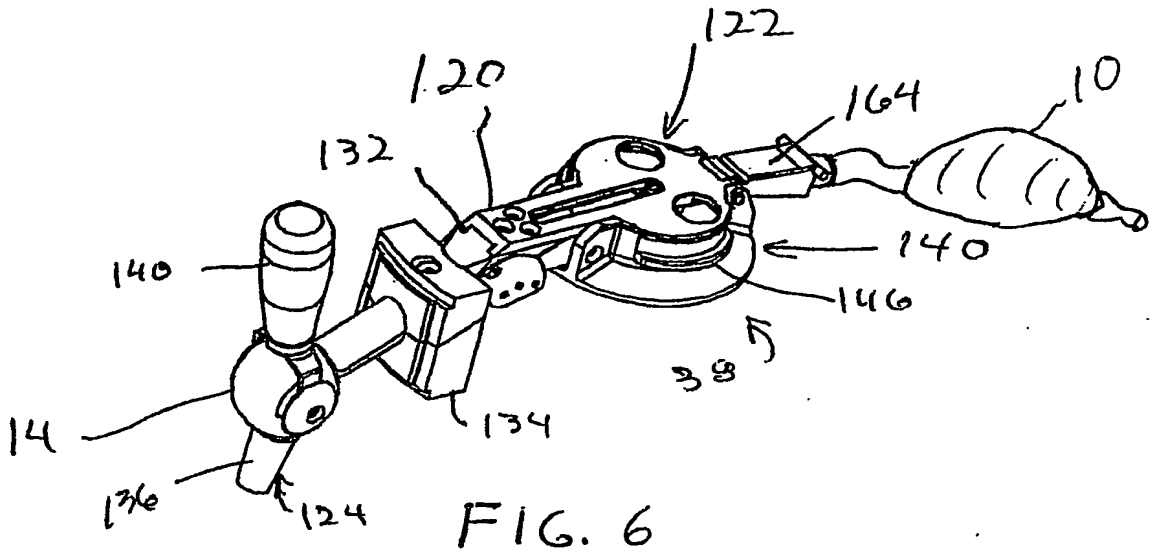

FIG. 6

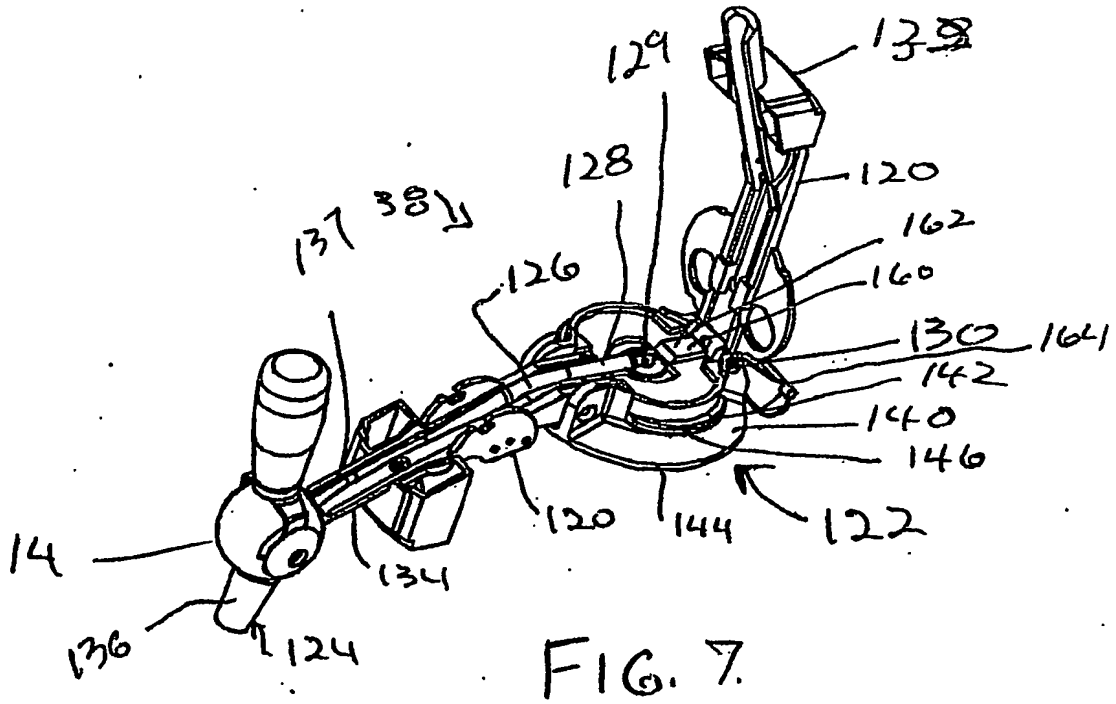

FIG. 7

Figure 8

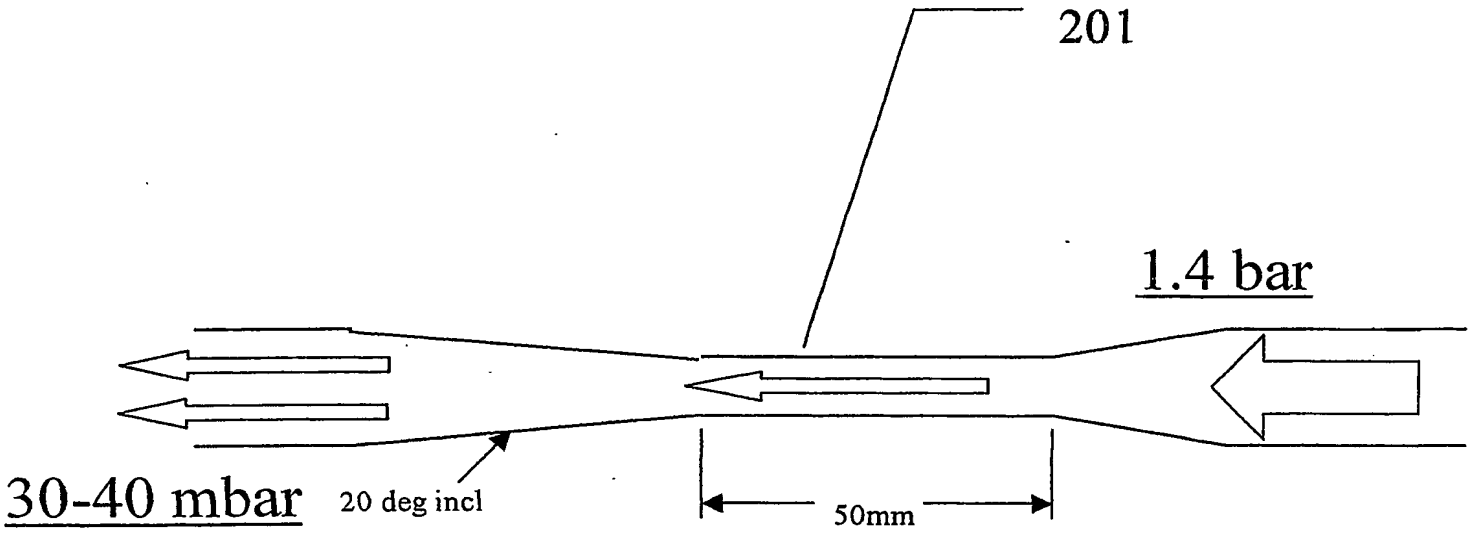

Figure 9

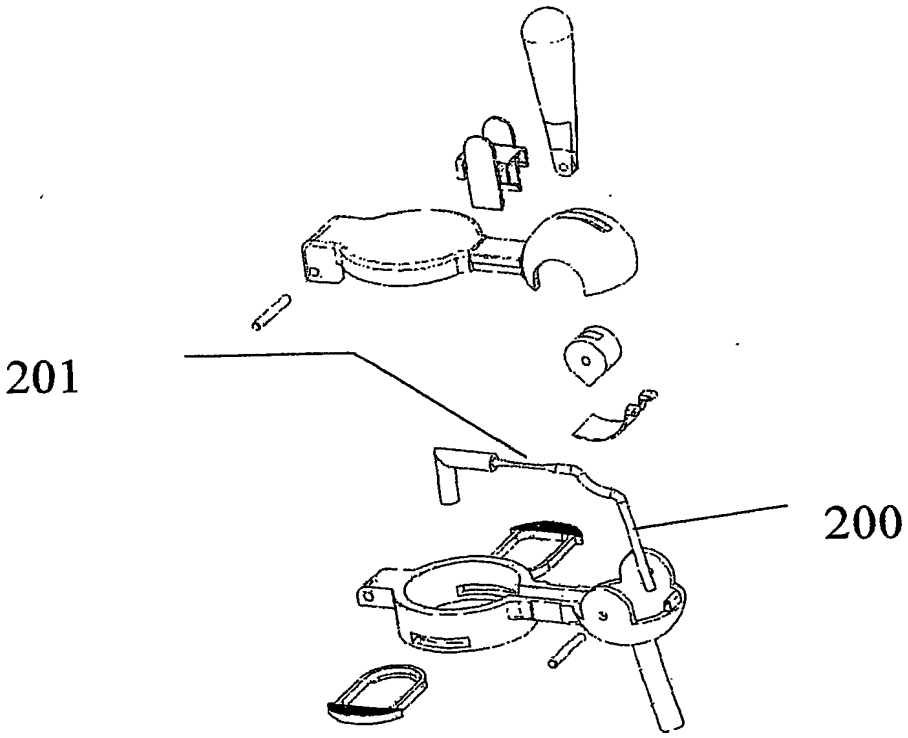

Figure 10